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ON

SYNOSTOSIS

OF

THE CRANIAL BONES,

ESPECIALLY

THE PARIETALS,

REGARDED AS A RACE-CHARACTER IN ONE CLASS OF
ANCIENT BRITISH AND IN AFRICAN SKULLS.

BY

JOHN THURNAM, M.D.



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PRESENTED
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AUTHOR

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1865.



Scaphocephalic Skull of a Western European, from Synostosis of the Parietals. Complicated with Open Frontal Suture.

[See *Nat. Hist. Review*, No. XIII., Jan. 1864. *Edin. Univ.* 117a.]

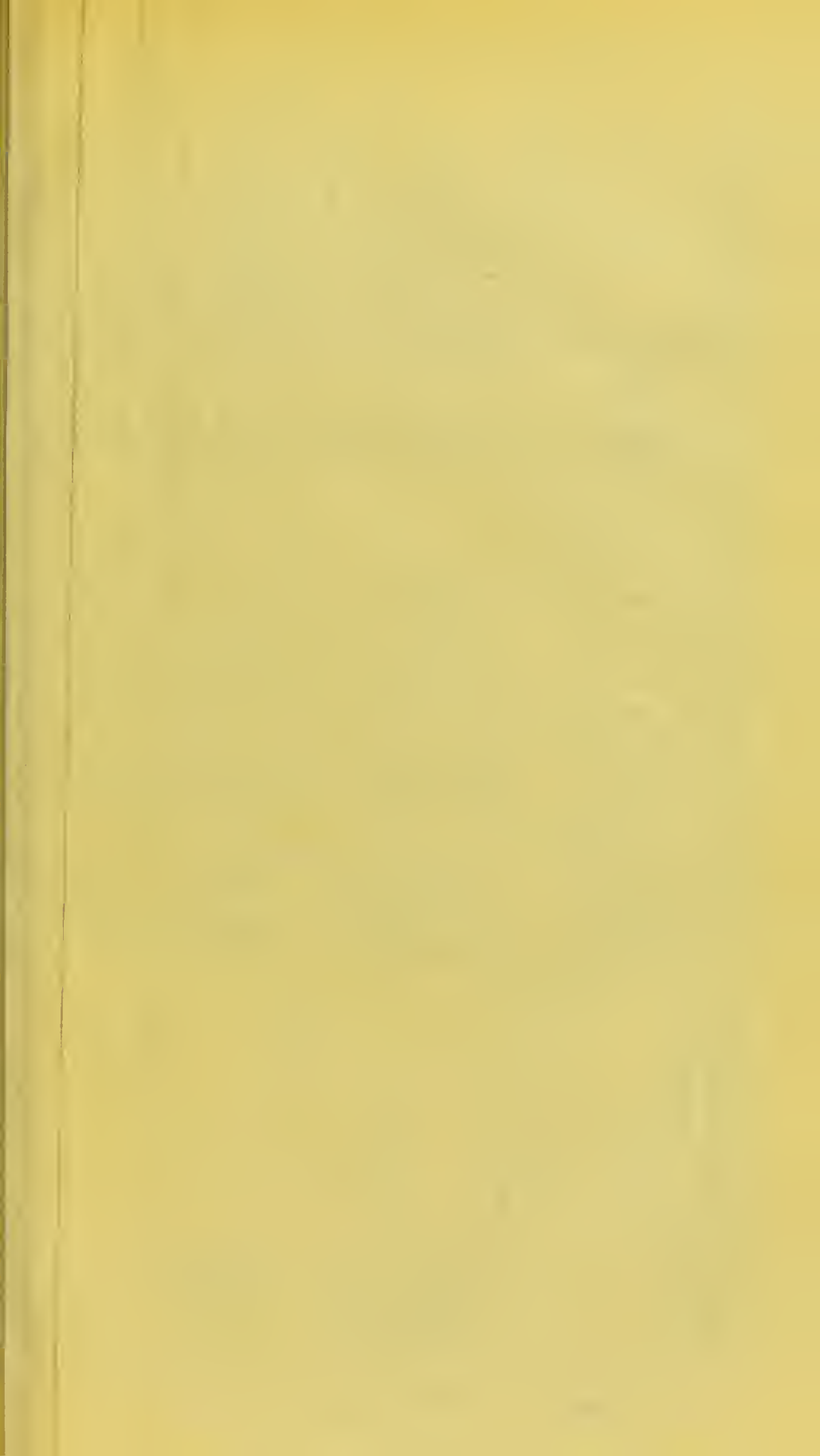


TABLE OF MEASUREMENTS OF 75 SKULLS, AFFECTED BY SYNOSTOSIS OF THE PARIETAL BONES.

Number.	Nation or Race.	Known or Probable		Cerebral Capacity.	Circumference.	III.	IV.	V.	VI.		VII.	A.	B.	Museum or Collection.
		Sex.	Age.						Length.	Breadth.				
A. I. SCAPHOCEPHAL.														
1.	German.	M	25	..	20.3	7.5	4.9	5.	..	..	..	.65	.67	Berlin, 12714.
2.	German?	F	55	78	20.1	7.5	4.8	5.	..	..	..	.64	.66	Halle, 111.
3.	Dano.	M	25	..	21.3	8.	5.	5.2	..	..	..	.62	.65	Göttingen.
4.	Croat.	M	50	..	21.4	7.9	4.9	5.3	..	..	..	.62	.67	Dresden, 515.
5.	Illyrian.	M	35	..	20.5	7.3	5.	7.4	..	..	..	.68	.73	Dresden, 512.
6.	Tartar.	M	25	..	19.7	7.3	4.7	5.4	..	..	..	.64	.74	Göttingen.
Averages														
7.	European.	M	35	108	20.6	7.6	4.9	5.3	..	..	..	.64	.69	(By Prof. Welcker).
8.	Scotch?	M	65	..	23.	8.7	5.0?	4.9	4.2	5.2	..	.57	.56	Edinburgh Univ., 117a.
9.	Scotch?	F	18	..	20.8	7.9	4.6	4.7	..	..	..	.58	.59	Edinburgh Univ., 117. *
Averages														
10.	Irish.	M	3½	..	21.9	8.3	4.8	4.8	4.2	4.8	..	.57	.57	(By Dr. W. Turner).
11.	Irish.	M	30?	..	21.8	7.2	4.7	4.9	..	..	..	.65	.68	Dublin, R.C.S. (Daniel B.)
Averages														
12.	English?	M	50	..	20.45	7.7	4.7	5.2	..	..	..	.61	.68	(By Dr. H. Minchin).
13.	English?	F	11	..	22.	8.5	4.8	..	..	..	..	.56	..	London, R.C.S. 5732 A. *
14.	English.	M	19	..	20.9	7.9	4.9	..	4.2	4.2	..	.67	.71	London, St. Barth., E. 1.
15.	English.	M	31	..	22.7	8.6	5.1p	6.	..	5.4	..	.62	..	London, Guy's, 105580. *
16.	English.	M	70	96	22.4	8.	5.5	5.7	..	5.4	..	.59	.69	Netley, A.M.D., 61.
17.	Scotch.	M	60	93	21.1	7.9	5.2t	5.7	..	5.2	..	.68	.71	Barnard-Davis, 69.
18.	Scotch.	M	50	..	22.	8.2	4.9t	5.7	4.4	5.	..	.68	.72	London, R.C.S., 5732.
19.	French.	F	..	..	..	7.5	5.1	..	..	..	..	.60	..	Glasgow Univ.
20.	Gentoo.	F	20	..	19.7	7.7	4.5p	..	..	..	..	.58	..	London, Guy's, 125.
21.	Negro, Mozambique.	F	40	76	19.2	7.3	4.5t	5.4	..	4.7	..	.61	.73	London, R.C.S. 5557.
22.	Australian, N. S. Wales.	M	50	88.5	21.8	8.3	4.8	5.3	4.3	5.1	..	.57	.63	London, R.C.S., 5373.
23.	Australian.	M	35	88	21.	7.7	5.2t	5.2	4.9	5.6	..	.67	.67	Barnard-Davis, 1122.
24.	Esquimaux.	M	25	87	21.1	7.75	5.2p	5.4	..	5.25	..	.67	.69	Mr. L. N. Fowler.
Averages in Cubic & Linear Inches, English														
Averages in C. Cent. & Linear Millimeters														
1.	Ancient Briton (Five Wells).	M	30	94	21.	7.7	5.3p	5.3	..	..	..	.68	..	Bateman, 89 T.
2.	Ancient Briton (Bowl's Barrow).	M	25	99	21.3	7.9	5.3p	5.5	4.4	4.9	..	.67	.69	J. Thurnam, 210.
3.	Ancient Gaulish (Du Val).	M	45	..	20.8	7.2	5.5	5.8	..	..	..	.76	.80	Paris, 'Hist. Nat.' 169.
4.	Ancient Greek.	M	70	92	21.	7.5	5.4	5.	4.6	..	..	.72	.66	Barnard-Davis, 978.
5.	English.	M	60	90	21.3	7.9	5.2p	5.2	..	4.95	..	.65	.65	Oxford Univ. 771.
6.	English.	M	40	..	20.7	7.8	5.2	5.	..	..	..	.66	.64	London, St. Thomas', 580.
7.	English.	M	25	..	21.	7.6	5.4p	5.2	..	4.8	..	.71	.68	Birmingham, Queen's C.
8.	English.	M	50	..	22.7	8.1	6.1p	5.3	..	5.2	..	.75	.65	Salisbury.
9.	English.	M	22	..	20.5	7.2	4.7	..	..	..	..	.65	..	Mr. T. Annandale.
10.	English.	F	33	72	19.8	7.3	4.9	..	4.3	4.8	..	.67	..	J. Thurnam, 216.
11.	Scotch?	M	70	..	22.	7.8	5.	..	..	..	..	.64	..	Edinburgh Univ. 1176.
12.	Scotch.	F	18	89	21.	7.4	5.2.	4.7	4.	4.4	..	.70	.63	Edinburgh Univ. 85.
13.	"European" (?)	M	45	..	20.2	7.4	5.2p	5.4	..	5.3	..	.70	.73	Bristol Infirmary, b. 23.
14.	Lapp.	M	30	..	20.5	7.3	5.5t	5.3	5.	5.6	..	.75	.72	Barnard-Davis, 1146.
15.	"Mahomedan."	F	20	77	20.	7.1	5.	5.1	..	4.4	..	.70	.71	Edinburgh Univ.
16.	Hindoo.	F	60	..	19.8	7.4	4.8t	4.9	..	..	..	.64	.66	Barnard-Davis, 884.
17.	Negro.	M	40	..	..	7.7	5.2p	5.3	5.	4.7	..	.67	.68	London, Guy's, 13050.
18.	Negro, African.	F	30	88	20.2	7.3	5.3p	5.2	4.8	4.9	..	.72	.71	Barnard-Davis, 100.
19.	Negro, West Coast.	M	40	..	21.1	7.6	5.25	5.75	..	..	..	.69	.75	Netley, A.M.D. 37 App.
20.	Negro, Dahoman.	M	30	98	20.8	7.7	5.2p	5.9	..	5.5	..	.67	.76	Barnard-Davis, 1229.
21.	Negro, Dahoman.	F	30	83	19.5	7.1	4.9	5.1	..	..	..	.69	.71	Barnard-Davis, 1234.
22.	Negro, Eboe.	F	50	79	19.6	7.	5p	5.3	..	4.9	..	.71	.75	Barnard-Davis, 294.
23.	Negro, Yoruban.	F	35	89	19.9	7.3	4.8t	5.5	..	5.2	..	.65	.75	Barnard-Davis, 1128.
24.	Negro, Osekami.	F	35	83.5	19.9	7.2	5.2p	5.	4.3	4.9	..	.72	.69	Barnard-Davis, 1072
25.	Negro, Congo.	F	35	..	20.	7.	5.3p	5.2	..	5.1	..	.75	.74	Haslar Naval Hospital.
26.	Hottentot.	F	35	..	20.2	7.4	5.1	5.5	..	..	..	.68	.74	Netley, A.M.D. 49 App.
27.	Bosjesman.	M	30	..	20.2	7.1	5.3p	5.2	..	4.65	..	.74	.73	London, R.C.S. 5358.
28.	Zulu.	F	18	84	20.	7.1	5.3p	5.2	..	5.1	..	.67	.72	Oxford Univ. 785c.
29.	Zulu.	F	18	80.5	19.7	7.1	5.2	5.2	..	4.9	..	.73	.73	Oxford Univ. 785d.
30.	Negro, Zanzibar, (Wahiu.)	F	25	70	19.2	7.	4.8	5.1	..	4.8	..	.68	.72	London, R.C.S. 5378, P.
31.	Negro, Zanzibar, (Wahiu.)	F	7	74.5	18.8	6.8	4.7p	4.9	..	4.4	..	.69	.72	London, R.C.S. 5378, S.
32.	Negro, Zanzibar, (Wahiu.)	M	30	84	20.5	7.4	5.3t	5.2	..	5.2	..	.71	.70	London, R.C.S. 5378, U.
33.	Javan.	F	..	19.7	6.65	5.15	5.3	5.3	..	..	..	.77	.79	Van der Hoeven, 89.
34.	Javan.	F	..	20.5	7.1	5.5	5.5	5.6	..	..	..	.77	.79	Van der Hoeven, 97.
35.	Dyak, Borneo.	M	25	86.5	19.7	7.	5.3t	5.2	4.5	4.9	..	.75	.74	Barnard-Davis, 281.
36.	Timorian.	M	30	..	21.	7.	5.	5.8	..	..	..	.71	.82	London, St. Thomas'.
37.	Kanaka, Sandwich Islands.	F	22	75	19.2	6.8	5.2p	5.1	3.8	4.9	..	.76	.75	Barnard-Davis, 434.
38.	Australian.	F	20	71	19.2	6.8	5p	5.1	4.1	4.9	..	.73	.75	London, R.C.S. 5306 A.
39.	Australian.	F	17	67	18.7	6.6	4.9	5.1	4.1	5.	..	.74	.77	Barnard-Davis, 915 a.
40.	New Zealander.	M	..	76	20.	7.	5.	5.3	..	..	..	.70	..	
Averages in Cubic & Linear Inches, English														
Averages in Cubic & Linear Millimeters														
B. II. SUB-SCAPHOCEPHAL.														
1.	Ancient Briton (Five Wells).	M	30	94	21.	7.7	5.3p	5.3	..	..	..	.68	..	Bateman, 89 T.
2.	Ancient Briton (Bowl's Barrow).	M	25	99	21.3	7.9	5.3p	5.5	4.4	4.9	..	.67	.69	J. Thurnam, 210.
3.	Ancient Gaulish (Du Val).	M	45	..	20.8	7.2	5.5	5.8	..	..	..	.76	.80	Paris, 'Hist. Nat.' 169.
4.	Ancient Greek.	M	70	92	21.	7.5	5.4	5.	4.6	..	..	.72	.66	Barnard-Davis, 978.
5.	English.	M	60	90	21.3	7.9	5.2p	5.2	..	4.95	..	.65	.65	Oxford Univ. 771.
6.	English.	M	40	..	20.7	7.8	5.2	5.	..	..	..	.66	.64	London, St. Thomas', 580.
7.	English.	M	25	..	21.	7.6	5.4p	5.2	..	4.8	..	.71	.68	Birmingham, Queen's C.
8.	English.	M	50	..	22.7	8.1	6.1p	5.3	..	5.2	..	.75	.65	Salisbury.
9.	English.	M	22	..	20.5	7.2	4.7	..	..	..	..	.65	..	Mr. T. Annandale.
10.	English.	F	33	72	19.8	7.3	4.9	..	4.3	4.8	..	.67	..	J. Thurnam, 216.
11.	Scotch?	M	70	..	22.	7.8	5.	..	..	..	..	.64	..	Edinburgh Univ. 1176.
12.	Scotch.	F	18	89	21.	7.4	5.2.	4.7	4.	4.4	..	.70	.63	Edinburgh Univ. 85.
13.	"European" (?)	M	45	..	20.2	7.4	5.2p	5.4	..	5.3	..	</		

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ON SYNOSTOSIS OF THE CRANIAL BONES, ESPECIALLY THE
PARIETALS, REGARDED AS A RACE-CHARACTER IN ONE CLASS OF
ANCIENT BRITISH AND IN AFRICAN SKULLS.* By John Thurnam,
M.D.

OBLITERATION of the sutures of the skull or *synostosis* of the cranial bones has of late received much attention, more especially from those distinguished German anatomists, Virchow, Lucæ, and Welcker; by whose labours the progress of a rational and scientific craniology has been so much promoted.

I propose to consider this subject in reference especially to one class of ancient British skulls, viz. those from the chambered and other long barrows of the *stone period*. I may here observe that the general form of these skulls is elongated or dolichocephalous, and that they are strikingly distinguished from the brachycephalous skulls from the circular barrows of the *bronze period*; not only by their general form, but also, as would appear, by their greater tendency to early and premature obliteration of the sutures. The mere fact of such a distinction in the skulls derived from two classes of ancient British tombs is of sufficient interest to deserve notice; but

* Read at the Meeting of the British Association at Bath, Sept. 1864; and here printed with additions and corrections.

I am the more induced to direct attention to it, as I think there is danger of a greater influence being assigned to this obliteration than is consistent with a true interpretation of the facts. This, I think, is done when the dolichocephalism characteristic of these skulls is regarded as the effect of the premature obliteration of their sutures. No doubt synostosis is a cause of dolichocephalism, as in cases of *scaphocephalus*, produced by the fusion of the two parietals, and obliteration of the sagittal suture. But in order that synostosis of the cranial bones should be the cause of an abnormal form of skull, it must commence at a very early period of life, if not indeed during the foetal condition. The forms of synostosis described and classified by the celebrated Virchow, as shown in his wood engravings, are altogether abnormal or teratological. They are, however, chiefly the skulls of cretins, idiots, epileptics, or insane persons; in whom a defective or irregular development of the brain is of frequent occurrence, and has probably an equal if not greater share in the production of the deformity of the skull than the premature ossification of the sutures which is associated with it. In his observations on the effects of synostosis as a cause of cranial deformities, Virchow expressly limits its influence to "the disturbances which the sutures undergo in early periods;" and adds the important words, "*for with senile obliteration of them, or even their fusion in adult age after perfect formation of the cranial bones, we have naturally nothing to do.*"* As shown by Professor Welcker, "the containing and contained parts—the skull and brain—grow with each other," though the special form into which the skull is moulded is "conditioned by the mechanical operations of the growing and living brain."† There can indeed be no doubt that the form of head proper to the race and to the individual is innate in the embryo, though liable to deviations both during intra-uterine and the earlier periods of independent existence.

The dolichocephalism of the Britons of the long-barrows and stone period is no more to be regarded as pathological than that of the African races, in whom there is likewise a great prevalence of premature synostosis. Neither is this last, as it ordinarily occurs after the period of puberty has been attained, pathological. On the

* *Ueber den Cretinismus, und ueber Pathologische Schädelformen*, 1851: Ges. Abhandlung. 1856, p. 899. It was long since observed by Otto, that obliteration of a suture "can only be properly considered as morbid, if observed previous to birth, or before the perfect development of the head."—*Pathological Anatomy*, by South, 1831, p. 160.

† *Wachsthum und Bau*, 1862, p. 20, 139.

contrary we may regard it as strictly a race-character; just as we may regard the same phenomenon in the Negro. In both it seems due to the same cause, defined by Welcker, as "a luxuriant bone-growth" in the still growing suture margins.* It is not improbable that in dolichocephalous peoples, the great longitudinal sagittal suture (in the same way, though in a much less degree than the frontal suture), may be more prone to early obliteration than the transverse ones, in consequence of the suture margins being more early brought into apposition, from the growth of the brain being more active in the longitudinal direction than in the transverse. However this may be, it is an observation of the late distinguished French anatomist Gratiolet, that in the inferior races, especially Africans and Alfouras, the sutures close much earlier than in Europeans, and likewise in a different order; the lambdoid closing first in the White, the coronal in the Negro and Alfoura, and *vice versa*.† M. Pruner-Bey also insists on the premature obliteration of the sutures as characteristic of the Negro. The frontal and lateral parts of the coronal suture are, he says, uniformly obliterated in early youth. Ossification next extends to the middle of the coronal and the sagittal, the lambdoid being the last to close.‡

It is well known that the *frontal* suture, which usually ossifies

* *Ibid.* p. 139. The same appears to be implied by Dr. Humphry, when he observes, "the sutures are commonly obliterated earliest in those skulls in which a heavy hard condition of the bones evinces a preternatural activity of the ossifying processes."—*Human Skeleton*, 1858, p. 191.

† *Comptes Rendus de l'Acad. des Sciences*, T. xliii. 1856, p. 428. "Dans l'homme blanc, les sutures s'ossifient d'une manière tardive. Cette oblitération se développe dans l'ordre suivant: 1, la suture sagittale; 2, la suture lambdoïde; 3, la suture fronto-pariétale. Dans les races Éthiopiennes et Alfouriennes, au contraire, l'oblitération des sutures est précoce; et la fronto-pariétale se soude avant la lambdoïde. Ainsi, chez le Blanc, le crâne se ferme d'abord en arrière; chez le Nègre et chez l'Alfouroux, il se ferme d'abord en avant. On observe souvent le même fait sur les crânes d'idiots appartenant à la race blanche. En outre, les récentes recherches de M. M. Baillarger, Cruveilhier et Vrolik, ont mis hors de doute le fait de l'ossification prématurée des sutures chez les idiots microcéphales, et sur l'absence de fontanelles chez eux au moment de la naissance." In a later memoir M. Gratiolet observes, "La persistance et la compléation des sutures sont en général un signe favorable, et peuvent être considérées comme les indices d'une perfectibilité plus ou moins étendue."—*Mém. de la Soc. Anthropol.* T. i. p. 394. See also *Bull. de la Soc. d'Anthrop.* T. ii. p. 178, 243. Dr. Meigs was unacquainted with M. Gratiolet's observations, when he remarked on "the periods at which the different cranial sutures are closed in the various races of men;" and when he asked, "To what extent are race-forms of the cranium dependent upon the growth and modifications of the sutures?"—Nott and Gliddon, *Indigenous Races*, 1857, p. 238.

‡ *Mém. sur les Nègres*.—*Mém. de la Soc. d'Anthrop.* 1860-63, T. i. p. 328, 336. M. Pruner-Bey also observes, "En général, la marche des soudures me paraît différer aussi selon la forme du crâne dolichocéphale ou brachycéphale."

within the first year of life, in a certain proportion of cases never closes, except with the other sutures in advanced age. The difference in the liability to the persistent frontal suture in different races must be known to all who are in the habit of examining skulls. In most Europeans it is by no means rare, and seems to occur in the proportion of about one in ten, in English, German, and French skulls.* Professor Weleker, who has devoted much attention to this subject, tells us that the open frontal suture is much less common in the inferior races; that in Mongols it is about as one in fourteen, in Malays about one in twenty, and in Americans and Negroes about one in forty or fifty.† Weleker indeed barely admits its possibility in the Negro, and says he has never seen an instance. M. Pruner-Bey tells us he only saw it once in the large number of African skulls which he examined. There can be no doubt that it is extremely rare. In Dr. Barnard Davis's collection, there are about ninety Negro and Negroid skulls, and in not one is the frontal suture seen. On the other hand, in the series of 166 of such skulls in the Museum of the Army Medical Department, there are four (Ibo, Krooman and Ashantee), in which it is persistent.‡ Altogether, its great rarity is clearly a race-character in the Negro. In a less degree, the same seems to have been the case with the dolichocephalous Britons of the stone period. Out of about 100 or 120 skulls and calvaria, which I have examined from the Long Barrows, I have found traces of the frontal suture in only four adult specimens.§ This gives a proportion of one in twenty-five or thirty. In the brachycephalous skulls from the Round Barrows, the open state of this suture is much more common; or according to my observations, about one in fifteen, which approaches that in modern Europeans.

* In the Museum of the Army Medical Department at Netley, out of 169 skulls of English soldiers, (natives of England and Ireland) I counted sixteen in which this suture is persistent, or nearly one in ten. In Germans, we learn from Professor Weleker, that it occurs as often as one in nine. (*Wachsthum und Bau*, p. 99-100). In the immense collection of French skulls in the catacombs of Paris, Dr. Leach counted it in numerous instances, and in the proportion of at least one in eleven. (Clift, *Catal. Mus. Coll. Surgeons*, part iii, 1831, p. 7).

† *Wachsthum und Bau*. p. 99-100, 143.

‡ G. Williamson, M.D. *Human Crania in Mus. Army Medical Department*, 1857, p. 78.

§ One is from the chambered barrow of West Kennet (No. 137); another from that of Rodmaton (No. 166, see woodcut, *Cran. Brit.* Pl. 59, p. (4); two others are from the long barrow at Dimlington. There are also two infant skulls, one from Tilshed, the other from Charlton Abbots, in which the same is seen: though the last seems to have belonged to a secondary interment.

Though the great liability, in the Negro, to premature obliteration of the sutures in general, and the almost infallible closure of the *medio-frontal*, is insisted upon by French and German anatomists, and anthropologists, no one appears to have pointed out that the posterior division of the median-longitudinal suture, or the *sagittal*, is especially liable to complete obliteration, both during the foetal and the infantile period. That this, however, is the case, I shall be able to adduce sufficient evidence to prove. It is a just observation of M. Pruner-Bey, that the order of obliteration of the sutures differs according to whether the skull-form is dolicho- or brachy-cephalous; a law altogether confirmed by the different state of the sutures in the dolichocephalous skulls from the Long, and in the brachycephalous skulls, from the Round Barrows. In the dolichocephalous Negro, as in the dolichocephalous Briton, it may be concluded, (from the researches of Welcker, on the growth of the cranial bones by their borders), that the special liability of the median-longitudinal (frontal and sagittal) sutures to obliteration, is due to the opposed suture margins coming sooner into contact than in brachycephalous peoples, in consequence of the growth of the brain being chiefly in the longitudinal, and much less energetic in the transverse and vertical directions. In addition to this anatomical cause, it may be surmised, as pointed out at the meeting at Bath, by Dr. John Davy, that physiological influences may contribute to the same result, and that a tendency to exuberant ossification may be produced in the Negro as also (it may be added) it may have been in the Ancient Briton, by a diet of a highly animalized nature, consisting chiefly of milk and flesh.

It is concluded that in order that synostosis of the cranial bones should be the cause of any peculiar form of the skull, it must be one of two descriptions. Either it must be of *intra-uterine* origin, when it is most efficient in the production of monstrous, or teratological forms; or *infantile*, and occur during the period of growth and development; when it produces deviations more moderate in extent, though still abnormal.* By the ossific union of the two parietal bones, and consequent effacement of the sagittal suture in foetal life is produced that very abnormal skull-form, now known as

* As Dr. Humphry observes, "After indigitation (of the sutures) has taken place, the interlocking of the bones is so intricate that I question whether growth can take place at their edges much more easily than in other parts of their extent." *loc. cit.* p. 190.

the scaphocephalic. The most marked examples of *scaphocephalus* seem to be those which are met with in Europeans, in whom the frontal lobes of the brain are largely developed, and produce perhaps by their displacement, and by the needful compensatory growth, that prominence of the frontal region which is so marked a



FIG. 1. *Scaphocephalic Skull of a Woman.**

feature in many of these cases. In the Negro, in whom the cerebral development, especially of the anterior lobes, is of a lower type, the more marked features of true scaphocephalus are more rarely seen, even when the synostosis may be presumed to have been congenital. The abnormal scaphoid skulls of the African races, as compared with those of Europeans, may be termed sub-scaphocephalic. They seem to fall very much under the definition of what is termed by Welcker, *synostotic dolichocephalism*.† This less

* For the sake of comparison with the Sub-scaphocephalie and Klinecephalie forms of Synostosis, more particularly treated of in this paper, I have, with the approval of Dr. W. Turner, repeated from his memoir the figures of two decided scaphocephalous crania. Fig. 1 is the profile of a skull, No. 27 of the Museum of the College of Surgeons, Edinburgh; Fig. 2 is the vertical view of a skull-cap, No. 117 of the University Museum; which last is remarkable for the large "beak" of its biparietal, and for the breadth of the frontal, which is greater than usual in scaphocephalus.

† "*Dolichocephali ex synostosi sagittali*," (*Wachsthum und Bau*, p. 15, 53).

marked sub-scaploid form is likewise not uncommon in the higher races, though in them it may be supposed usually to originate after

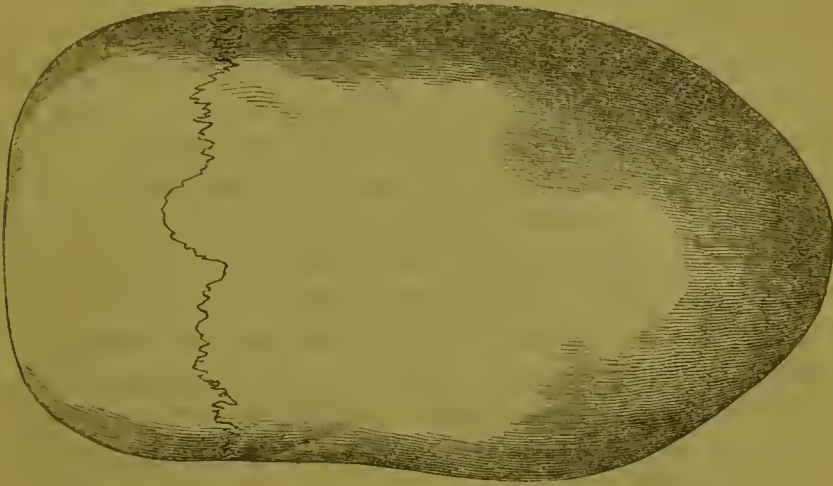


FIG. 2. *Vertical View of the Scaphocephalic Skull of a Man.*

birth, and not during intra-uterine life. A pathological abnormal form of skull, of less frequent occurrence, but which likewise appears to depend on fusion of the parietals during the fœtal state, or the earliest period of independent life, is the saddle-shaped skull, or *kli-no-cephalus*. According to Virchow, this deformity usually arises from ossification of the spheno-parietal sutures. In some cases, however, klinocephalism, combined with prominence of the supra occipital, is developed in skulls in which the spheno-parietal sutures are open, but in which the sagittal is entirely obliterated.* This is the case in the remarkable skull of a Gentoo child, in the Museum of the College of Surgeons (No. 5556).† It may be suggested that

“There are also intermediate forms between marked scaphocephalus, and the more ordinary forms of *dolichocephalus synostoticus*, which may owe their rise to a fusion of the sagittal suture in the later fœtal period, and in earliest childhood.”—*Zwei seltene Difforn.* 1863, p. 7.

* Virchow, after defining the cause of klinocephalus, tells us that “in an example in his collection, the fusion of the spheno-parietal sutures is combined with synostosis of the parietal bones, so that a prominence of the occipital scale is added to the usual deformities of klinocephalism.”—*Ges. Abhandl.* p. 900.

† In the Museum of Anatomy, at Cambridge, is the skull of a Negro of Guinea, aged about 20 years, in which the same combination of klinocephalism with synostosis of the parietals is seen. I am able to say positively, that the spheno-parietal sutures are quite open, and that the sutures in general, with the exception of the sagittal and apex of the lambdoid, are quite as distinct as usual, perhaps rather more so. In this skull, as in that of the Gentoo, both the parietal foramina are well marked. The brachycephalous proportions of the former, (‘86)

the klinoid form of this skull, which, according to the ordinary view, ought rather to have been scaphoid, may depend upon the activity of the growth of the middle lobes of the brain, in the direction outwards, or of the parietal tubers; whilst in scaphocephalus, the compensatory cerebral growth is forwards and backwards, in the axis of the anterior and posterior lobes. This view is confirmed by observing that in many cases of the second, or sub-scaphoid form of synostotic dolichocephalus, there is a considerable saddle-shaped contraction in the coronal and temporal regions; though not enough to constitute klinocephalus, as usually understood. In this way, a sort of gradation is to be noted between scaphocephalus and klinocephalus, depending on synostosis of the parietals. In both the cases of the first of these deformities in ancient British skulls from Long Barrows, which are figured and described in this paper, a certain tendency to klinocephalism is to be observed.



FIG. 3. *Vertical view of the Klinocephalic Skull of a Gentoo child.—Quarter Diameter.*

In the Table of Measurements appended hereto, I give all the examples of abnormal synostosis of the parietals which I have had

are no doubt due to the synostosis of the apex of the occipital with the biparietal. A tendency to klinocephalism is especially observable in the skulls of Kanakas, when affected by synostosis of the parietals. In the large series of about 135 Kanaka skulls in the Barnard-Davis collection, there are six instances of this form of synostosis, only one of which is sub-scaphocephalous, whilst in the others a greater or less degree of saddle-shaped contraction, and in one complete klinocephalism, is to be observed. Measurements of these skulls are given in the Table. With other synostotic skulls in this rich collection they are described by Dr. Davis in a memoir now being printed in the Transactions of the Society of Sciences of Haarlem. My attention was more especially drawn to this subject by the opportunity afforded me of perusing part of this memoir whilst in manuscript more than two years ago.

the opportunity of examining; classed as accurately as may be, under the three heads of, I. SCAPHOCEPHALI; II. SUB-SCAPHOCEPHALI; and III. KLINOCEPHALI.

As is well known, the African peoples are naturally dolichocephalic. In them also the bones are of remarkable density, and a great disposition to exuberant and redundant ossification is observed in them. Of all peoples, I believe abnormal obliteration of the sagittal suture with complete synostosis of the parietals is most frequent among them. Out of twenty-four cases of complete synostosis of the parietals, which I had measured when this paper was read, seven are instances of scaphocephalus; but in the others the cranial form, though elongate, does not present that flattening of the sides, prominence of the frontal and of the supra-occipital, or that fully scaphoid or keel-shaped form of the biparietal, which are necessary to the idea of scaphocephalus properly so called; different degrees of which however are to be observed. Of the whole number of twenty-four skulls, as many as twelve are of Africans; one of these, that of a negro of Mozambique, being truly scaphocephalic.* The frequency

* Of the twenty-four skulls here referred to, twelve are in the Museum of the Royal College of Surgeons, London; two in that of Guy's Hospital; four at Oxford; three at Netley; one at Haslar; one at Bristol; and one at Salisbury. I have not altered these numbers, nor the passage in the text with which they are connected. Since the paper was read, however, I have added to the Table of Measurements of Skulls with Synostotic Parietals, many further examples. Especially, must be noticed those in the rich collection of Dr. J. B. Davis, who has obliged me with access to their measurements in his Catalogue, as yet in manuscript. It appeared also expedient to embrace in the table, measurements of the six scaphocephalic skulls given by Professor Weleker in his latest memoir on this subject (*Zwei seltn. Difform.*); and likewise those of others given by Dr. W. Turner in his paper already referred to; the former being from the museums of Germany, the latter from those of Edinburgh. Dr. Turner has obliged me with some additional measurements; and I am also indebted to Dr. H. Minchin, of Dublin, for measurements of the two skulls described by him in the memoir by which in this country attention was first drawn to this kind of cranial malformation. With a few exceptions, for which I am indebted to friends, the rest of the measurements are by myself.

In the division II. SUB-SCAPHOCEPHALI, a few of the skulls are not strictly entitled to this designation. In these, the relative length is simply more or less increased, and no distinctly scaphoid tendency is seen. These *synostotic dolichocephali* pass by such insensible gradations into the subscaphoid form, that unless the whole could have been brought together for minute comparison, their separation into two sub-classes could not have been satisfactorily carried out.

To some extent, though with no certainty or precision, the table may indicate the liability of different races to this form of synostosis. The cases in Europeans have no doubt been selected for preservation, in consequence of their abnormal form; but as regards those of other races there has probably been little or no selection.

of synostotic parietals in Africans is very remarkable, and few collections are without one or more examples. In passing, for another purpose, through the Gallery of Anthropology (*Salle Cuvier*), in the Museum of Natural History of Paris, my eye was attracted by a series of skulls of Hottentots, five or six in number, one of which I found presented no trace whatever of a sagittal suture. Adjoining these, was another small series of skulls of Namaquas, one of which presented the same form of synostosis. In the series of twenty skulls brought from Kilwa in East Africa by Captain Burton, now in the Museum of the College of Surgeons, three exhibit obliteration of the sagittal, one of them (No. 5378 P) in a most complete form.* In a series of twelve Dahoman skulls from West Africa, recently added to the collection of Dr. Barnard Davis, two have the sagittal suture completely obliterated and the form elongate—'67, '69. The former (No. 1229) is that of a man, the other (No. 1234) that of a woman, each of about 30 years of age.

The most remarkable instance, however, is that afforded by the capture of two schooners, laden with about 100 slaves from Cape Lopez, Congo, on the west coast; who were carried to Fernando Po, where several of them died. Four were examined after death, and in each instance, "the sagittal suture was wanting;"—the conclusion adopted by the navy surgeons, Mr. Ballard and Mr. Wallace, being "that in this race of blacks such is the usual cranial conformation." A different view was taken by the late Dr. Graves, who regarded "the obliteration of the sagittal suture as a mere accidental variety;" and by Dr. Prichard, who added his belief, "that the want of this suture is not characteristic of any particular race."† Our additional knowledge of this subject appears to justify some modification in the

* They are the skulls numbered 5378 P, S, and U. The first, that of a man, is a good example of *synostotic dolichocephalus* or of the *subscaphoid* skull. The second is that of a girl of about seven years, and is important, as showing the order in which the different portions of the sagittal undergo infantile obliteration. This would seem to have commenced in the 4th, or inter-foraminal division of Welcker, and to have extended on the one hand to the 5th, and on the other to the 3rd, and so to the 2nd. The 1st, or coronal division, with a small part of the 2nd, remains open. In the skull U, that of a man aged about 35, the anterior division likewise remains open. I am informed by Captain Burton, that the whole of these skulls are those of persons who died of cholera, chiefly slaves of the *Wahion* tribe,—somewhat Semiticized Africans.

† *On the Supposed Want of the Sagittal Suture in Certain Tribes of Negroes.* Studies in Physiology and Medicine, 1863, p. 344. Med. Chir. Review, 1836, N.S. No. 49, p. 285. One of the skulls is in the Museum at Haslar Hospital, where I have had the opportunity of measuring it.

views adopted by these two eminent men ; and to warrant the inference that a great relative frequency of congenital obliteration of the sagittal suture, and consequent synostosis of the parietals, is, in fact, a characteristic of the African races, as it may be of others likewise, which have naturally a dolichocephalous form of skull.

That the premature obliteration of the sutures is in part due to a tendency to exuberant ossification, is confirmed by the fact, that though in the dolichocephalous races the sagittal is more liable to be effaced than the others, obliteration is by no means confined to it ; but that several sutures in the same skull, both longitudinal and transverse, are often implicated. In such instances, the concurrence of both the longitudinal and transverse forms of synostosis—if we adopt a term which it might be better to restrict to obviously abnormal and pathological conditions—ought to be compensatory the one of the other, and no particular dolichocephalism be observed. This would accord with the celebrated law established by Virchow, “ *that by synostosis of a suture the development of the skull is always retarded in the direction perpendicular to the synostotic suture.*”* In the dolichocephalous skull from the long barrow at Winterbourn Stoke described more fully hereafter, the coronal and sagittal sutures are almost equally obliterated, and though the lambdoid is well marked externally it is completely effaced within, so that the calvarium is converted into a solid osseous box. The spheno-parietal and spheno-frontal sutures are moderately distinct. It would be impossible from any thing which appears in their present state, to attribute the dolichocephalism of this skull to the premature ossification of the sutures. In other skulls from the long and chambered barrows distinguished by their elongate form, I find the sagittal suture open ; whilst contrary to what would be found were Virchow’s law applicable to them, the lambdoid and coronal are quite obliterated.

It is very possible, as observed by Dr. Wm. Turner, “ that through the action of the premature union of adjacent bones, aberrant forms of crania may arise in individuals of any given nationality, possessing a shape quite different from that of the race to which

* *Loc. cit.* p. 936. The sutures of the skull are divided into three classes ; 1. *Median-longitudinal* ; 2. *Transverse* ; and 3. *Lateral-longitudinal* ; the first allowing growth in the direction of breadth, the second in that of length, and the third in that of the height of the skull. Welcker, *loc. cit.* p. 13, Taf. IV.

they belong.”* In the very nature of things, however, it may be remarked that such cases must be exceptional. To suppose that entire families or even tribes may be the subject of an abnormal tendency to ossification of the sutures, by which the natural form of the skull becomes changed, it may be from a brachycephalous to an elongate type, appears contrary to probability.† The largest collection of dolichocephalous British skulls is, I believe, that in my possession, having been procured by myself and friends from chambered and other long barrows in the counties of Wilts and Gloucester. After a minute examination and comparison of more than fifty of such skulls and calvaria, I am unable, except in the few evidently abnormal cases described and referred to in this paper, to infer any connexion between the situation and extent of effacement of the sutures and the particular forms which the skulls present. In some the median-longitudinal, in others the transverse sutures, are those principally obliterated; in all however the form is more or less dolichocephalous. The long form of skull and the premature obliteration of the sutures, thus appear to be coincident phenomena, not standing to each other in the relation of cause and effect, though they are probably both of them characteristic of the race.

Let us now examine the evidence as to the tendency to obliteration of the sutures, and especially to synostosis of the parietals in the dolichocephalous Britons of the Long Barrows, which forms one distinction between them and the brachycephalous Britons of the later Round Barrows. No case of true scaphocephalus has come to light; but out of from one hundred to one hundred and twenty skulls and calvaria of this class which are known to me, there are two well-marked examples of the sub-scaphocephalic variety of synostosis, both of which have some tendency to the klinocephalic form.

In the Bateman collection, the skull 89 T. is that of a young man from a galleried tumulus at Five Wells Hill, near Taddington, Derby-

* On Cranial Deformities, and more especially on the Scaphocephalic Skull. By W. Turner, M.B.—*Natural History Review*, Jan. 1864, Vol. iv. p. 105.

† Something like this is seen when the very rare case occurs of scaphocephalus in a skull of brachycephalous race-form. An instance of this is met with in the remarkable skull of a Lapp (No. 1146 of the Barnard-Davis Collection, and No. 14, II. in the Table appended hereto), in which a scaphoid bi-parietal is combined with normally brachycephalous characters.

shire,* which I am enabled to describe and figure, through the kindness of Mrs. Bateman, of Youlgreave. All the sutures are quite distinct and open, with the exception of the sagittal, which is com-



FIG. 4.—*Sub-scaphecephalic Skull from Long Barrow, Five Wells Hill, Derbyshire.*

pletely obliterated. The frontal region is somewhat narrow and high; the supraoccipital full. Behind the coronal suture there is a considerable saddle-formed contraction, and the parietal tubers are

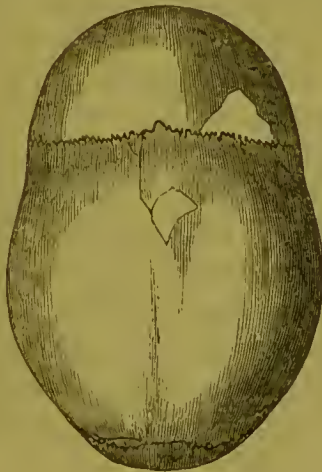


FIG. 5.—*Vertical View of the same Skull.—Quarter Diameter.*

round and prominent. It cannot be said there is any trace of a formerly existing sagittal suture; but near the coronal end of the

* Bateman. *Vestiges*, 1848. p. 91; *Ten Years' Diggings*, 1861. p. 262. *Journal British Arch. Assoc.* 1852 vol. vii. p. 211, 213. *Cran. Brit.* p. 232. Pl. XVI, 33, p. (4).

central line of the biparietal is the commencement of a very slight carina, which is continued along the median line of the frontal. In the line where the sagittal suture ought to be, in the third, fourth, and fifth divisions of Welcker, a slight groove or depression may be perceived; and around this for some distance the surface of the bone has an appearance of roughness and porosity, with many minute openings studding it. Among these I detect no certain trace of either of the parietal foramina. The upper maxillaries are short, the supranasal and supraciliary bosses of the frontal prominent. There is no lower jaw with the skull.

Whilst preparing this paper in September, 1864, I excavated a remarkable long tumulus near Imber, in South Wiltshire, called Bowl's Barrow, and obtained from it a fine specimen of the same form of synostotic eranium.* The skull, No. 210 of my collection, is that of a man from 20 to 25 years of age. It is a massive skull, having a thickness which reaches $\frac{5}{8}$ of an inch, or fifteen millimeters, in the frontal bone. The forehead is narrow, elevated and smooth, the supranasal prominence full, the face narrow, the upper maxillaries short; all the sutures except the sagittal appear distinct and unossified, and the central part of the coronal is widely open. Around the junction of the biparietal and occipital, is a considerable opening, in consequence of the posthumous decay of the bones. It follows that only the anterior half of the line of the sagittal suture can be traced; but, as this portion of the suture is the last to ossify, there can be no doubt that the whole was obliterated.† There is no trace whatever of any suture; but where it should have been, a somewhat rugose and thickened condition is detected, though more distinctly by the touch than by sight. A considerable and wide saddle-shaped contraction behind the coronal suture loses itself in the temporal fossæ. The parietal tubers are full; but not being so prominent as

* For a description of this Barrow, and of the other skulls obtained from it, see *Memoirs of the Anthropological Society*, vol. i. 1865, p. 472.

† To the right of the line of the sagittal, and running parallel with it, is a sharply-defined crack extending to the coronal suture. From its appearance and from a peculiar perforation at its further end, I conjecture that the skull may have been cleft at or before death, and may be that of a slave slaughtered at the burial of his lord. On this subject see *Memoirs of the Anthropological Society*, vol. i. p. 146-8, 480. *Cran. Brit.* pls. XXVI, 50, XXVII, 59. *Archæologia*, vol. xxxviii., p. 419.

in the skull last described, the tendency to klinocephalism is less apparent. As in that specimen, there are slight traces of a "beak" in the centre of the biparietal. Both in the vertical and profile view, especially the former, the narrow and abnormally elongate form



FIG. 6.—*Sub-scaphecephalic Skull from Bowl's Barrow, South Wiltshire.*

of this skull is well seen. It is a very characteristic specimen of sub-scaphecephalic synostosis.



FIG. 7.—*Front view of the same Skull—*



FIG. 8.—*Vertical view of the same Skull—*
quarter Diameter.

The above are the only examples of complete fusion of the parietals which have come to my knowledge in the skulls from

the Long Barrows of the ancient Britons.* There is, however, one cranium figured and described in the *Crania Britannica* (Pl. XXVI, 50), which was obtained by me from the chambered Long Barrow at West Kennet, the narrow and keel-shaped roof of which, as in two or three others I have seen, may be in part due to obliteration of the sagittal suture, commencing after birth. After describing this, I may call attention to two other skulls which have been thought to be deformed by synostosis, but which seem to me to owe nothing of their dolichocephalism to that effacement of the sutures which is present in them. This I believe to be of the prematurely senile description, and to date from a time long after the brain- and skull-form have been fixed and determined.

The skull from the sepulchral chamber at West Kennet is that of a young man of about 30 years of age. With the exception of the terminal parts of the coronal, the coronal, squamous, and lateral longitudinal sutures are open and even gaping; whilst the sagittal and apex of the lambdoid are almost completely ossified. Dividing the sagittal suture into the five portions described by Professor Welcker, the obliteration is most complete, and leaves scarcely a trace in the fourth or interforaminal; most nearly approaches the same degree of effacement in the third or central division; is less complete in the fifth or occipital, though still far advanced; less still in the second; and least of all in the first or frontal division, where it abuts on the gaping coronal, and is quite distinct. A *carina* corresponds to the line of the sagittal suture, especially in its three central divisions, where the obliteration is most complete. The summit of the parietals on each side of the obliterated sagittal has a nodose, eburneated character indicative of a certain degree of hyperostosis such as is observed in many scaphocephalic and other synostotic crania. The right parietal foramen is alone present, and is of

* In an ancient Gaulish skull from the dolmen of Du Val (Oise), preserved in the Gallery of Anthropology of the Museum of Natural History at Paris (No. 169) I detected complete synostosis of the parietals apparently congenital. The skull is that of a man of about 45 years. The coronal suture is distinct and open, the lambdoid much obliterated; there is no trace whatever of the sagittal, but considerable rugosity in the line where it is usually seen. The traces of the left parietal foramen are trifling in extent; there are none of the right. The form of this skull is more dolichocephalous than that of the other male skulls found with it, and relatively to their average type it may be regarded as a long skull (76). The ancient Gaulish skulls differ from the British, in usually presenting a mixture of the two types, long and short, in the same tomb.

unusual size. The breadth of the skull is as $\cdot 67$ to the length, which is very disproportionately narrow. Though this exaggerated dolichocephalism may in part be due to infantile synostosis of the parietals, comparison with another cranium from the same chamber (No. 138), proves that the elongation and narrowness of the first is very partially dependent on the synostosis, and that its form has been naturally, and from the first dolichocephalic. In this last skull, perhaps that of a brother, the form is quite dolichocephalic, the breadth being in the proportion of $\cdot 71$ to the length. The parietal eminences are however well expressed, and there is no trace of any sagittal ridge or carina. On the internal surface *all* the sutures (except the squamous) are obliterated, but they are quite distinct and beautifully marked externally, excepting the fourth division of the sagittal, which, in accordance with Welcker's law, is partially effaced. There are two small parietal foramina in the usual situation. This skull presents a tendency to prematurely senile obliteration; that last described is the subject of infantile and abnormal synostosis.*

The skull already referred to from the Long Barrow near Winterbourn Stoke (No. 159), which is that of a man of perhaps not more than 25 years, presents even a greater amount of prematurely senile obliteration.† “The coronal and sagittal sutures are almost entirely effaced, so that the synostosis of the frontal and parietal is nearly complete.” The proportion of the breadth of this skull to its length is $\cdot 75$; so that it does not belong to the exaggeratedly dolichocephalic class, but is sub-dolichocephalic, or indeed rather orthocephalic. It is clear there is no relation between the degree of dolichocephalism and the synostosis, which in this instance is so complete as to leave but slight traces of the affected sutures. A general tendency to ossification appears to be shown by the considerable exostotic growth on the *linea aspera* of the right femur, of which the obliteration of the sutures is another symptom.

* Professor Welcker insists much on the distinctions between infantile and senile obliteration of the sutures. “*Infantile obliteration* solders the bones mostly through the entire thickness; the ossification has sharply defined borders and makes no flaws. *Senile obliteration* cements at its commencement here and there some of the suture teeth, so that open chinks or interspaces remain; frequently the growing together of the *tabula vitrea* is already complete, whilst externally spots still open are visible.” *Loc. cit.*, p. 139.

† The skull is fully described, with the barrow whence it was obtained, in *Memoirs of the Anthropological Society of London*. Vol. i. p. 140, Plate I.

Agreeing to this, is the nodulated and rugose character of the upper halves of the frontal and two parietals, the latter of which especially are studded with fine perforations. The right parietal foramen is alone present. As in extreme age, the entire calvarium is converted into a solid box of the hardness of ivory, the whiteness of which is simulated by that of its internal surface.

Another dolichocephalic British skull from the chambered barrow at Rodmarton, Gloucestershire, lithographed and described in the *Crania Britannica* (Pl. XXVII, 59),* is that of a man of about 50 years of age. The proportion of the breadth to the length is .72. "Externally, the great sutures are tolerably distinct, though, with the exception of the squamous, they appear to be obliterated internally. Of the fronto-sphenoid, the lower parts of the coronal, and the left occipito-mastoid there is scarcely a trace within or without." Here, the ossification of the sutures is very general; the transverse the median, and lateral-longitudinal, are all affected by it; so that the dolichocephalism can hardly be conceived as being produced by the synostosis. In this skull the obliteration is doubtless of the premature senile description; but though the cranium of a man more advanced in life than that from Winterbourn Stoke, it is instructive to observe that the obliteration is less advanced than in that more youthful specimen.

In a recent paper by Dr. J. Barnard Davis, the doctrine of synostosis appears to me to be carried beyond its just limits, with a view of explaining the peculiarities of the now-celebrated Neanderthal skull. That it is synostotic is not to be doubted, though how far its peculiarities have been produced by the obliteration of the sutures appears doubtful. However this may be, there is one passage in Dr. Davis's paper on which I desire to make a few observations. "In cases," says Dr. Davis, "in which the sagittal suture is not closed, the obliteration of the spheno-frontal, -parietal and -squamosal sutures, which often carries that of the sides of the coronal with it, I am satisfied, gives rise to an elongation of the calvarium. * * * * This ossification has a material influence (sometimes with that of the

* This skull has been presented to the cranial collection of Dr. J. Barnard Davis, in which it is No. 1210. A second skull from the same chamber of very similar form, and with the sutures almost equally obliterated is figured in the *Memoirs of the Anthropological Society of London*, vol. i. p. 153, figs. 12, 13.

sagittal suture, where it operates most potently, and sometimes without) in producing the dolichocephalism of the skulls, derived from the long and chambered barrows of the ancient Britons; for it is a remarkable fact, not yet explained, that these skulls are found to be specially obnoxious to synostosis."* Of the four sutures named, which occupy a limited space in each temporal region, the obliteration of the speno-frontal and speno-parietal, if originating during the period of growth and development, may indeed produce a narrowness and depression of the anterior part of the skull. Supposing the lambdoid and occipito-mastoid to be at the same time unossified, and yielding within and without (though this very frequently is not the case, the last-named suture, as shown by Welcker, being particularly liable to premature obliteration†), then some degree of compensatory growth in the direction of the occiput, may be allowed, though by no means sufficient for "producing" a dolichocephalism not naturally inherent in the brain and skull. As regards the lower parts of the coronal and the speno-temporal sutures, these belong to the transverse order, and their obliteration would rather have the effect of detracting from the length of the cranium. There is no doubt that the sutures referred to are often obliterated in skulls from the long and chambered barrows; though whether so frequently as in other dolichocephalous skulls, and especially those of Negroes, is very uncertain. The early period at which two of them, viz., "the speno-frontal and the lowest parts of the coronal," are usually obliterated is pointed out by Welcker, who observes, that they "form one of the earliest seats of senile synostosis," which he explains by the mutual pressure to which the opposed inverted squamous edges of

* *The Neanderthal Skull: its Peculiar Conformation Explained Anatomically*, p. 7. Memoirs of Anthropol. Soc. of London, vol. i. Comp. Bull. de la Soc. d'Anthrop. de Paris, t. v. p. 716. I quote from the English memoir, as "printed for private distribution." Dr. Davis adds in a note, "There is a probability that the earliest examples of human crania obtained from these barrows were synostotic, and also deformed in the same way as the Neanderthal calvarium. At all events, one of the most striking peculiarities, which impressed Sir Richard Colt Hoare and his friends with the greatest force, was the '*frons valde depressa*.'"

Sir Richard however, though no anatomist, observed that the skulls were "totally different in their formation from any others which his researches had led him to examine." *Archæologia*, vol. xix. p. 48; Comp. *Cran. Brit.* pl. XXIV, 5, p. 151. These researches had been chiefly confined to the circular barrows; it was his coadjutor, Mr. Cunningham, who opened eleven of the long barrows. The long barrows which have been excavated of late years have produced skulls remarkable not only for their length, but likewise for their depressed (platycephalic) form.

† *Wachsthum und Bau*. p. 18.

the bones forming these sutures are subject ;*—a pressure, which it may be observed, must be greatly increased by the action of the temporal muscles in speech and mastication. Now as premature senile obliteration, according to the same distinguished observer, may occur as early as the twenty-fifth year,† it will scarcely be possible, in crania of a mature or moderately-advanced period of life, to assign any high value to the connection between the obliteration of the sutures and any peculiarity in the form of skull,—especially as regards the slighter deviations from what is normal. Indeed, for such a purpose, observations on the skulls of the young can alone be depended upon.

It is proposed to explain the post-coronal depression which is observed in so many of the ancient British skulls from the long barrows, as well as the dolichocephalism proper to these skulls, by the obliteration of the sutures in the temporal region, and the synostosis of the cranial bones in this spot.‡ That synostosis of the parietals and alisphenoids, when originating before the “perfect formation of the cranial bones,” will, as explained by Virchow, produce the saddle-shaped contraction in the post coronal region, which, as we have seen, is named by him *klinocephalus*,§ there can be no doubt. But, that the slighter grades of this peculiar form, such as are commonly observed in dolichocephalous British skulls, can be thus explained, I am by no means convinced. In the imperfect skulls

* *Ibid.* p. 18. Professor Virchow also observes on the frequency with which “ossification of the spheno-frontal suture is combined with that of the spheno-parietal and coronal sutures.” *Ueber den Cretinism. Ges. Abhandlung*, p. 900.

† *Loc. cit.* p. 17. “Unter 74 Schädeln 25-70 jähriger individuen, deren Pfeilnaht von seniler Obliteration betroffen ist.” * * *

‡ “The constantly recurring depression running across the calvarium immediately behind the coronal suture, in these skulls, is another of the results of the obliteration of the sutures situated in the temporal region. The synostosis of the cranial bones, in this spot, has the effect of contracting the whole of the pre-temporal and pre-parietal circumference of the calvarium in a similar manner to the operation of a constricting bandage. So that the *tête annulaire* of Gosse, or *sattel-formige Einschnürung* of Virchow, is not always the consequence of artificial compression, as has been supposed. * * * It is a frequent phenomenon in these synostotic crania, and premature ossification of the sutures is its true cause.”—*Cran. Brit.* chap. ix. p. 231; where Dr. Davis explains his views as to the long-barrow skulls at greater length.

§ “Synostosis of the parietal and sphenoid bones, through ossification of the spheno-parietal suture, produces a saddle-shaped contraction, which courses more or less completely over and around the head in the temporal region, and causes an almost biscuit-shaped form of the skull-roof, because the forehead projects forward and the parietal eminences towards the sides.”—*Ueber den Cretinism. Ges. Abhandlung*. p. 900.

and calvaria, such as are usually obtained from the long barrows, the alisphenoids, with the adjoining edges of the parietals are very commonly broken away, so that the condition of the sutures in the temporal regions cannot be ascertained. This especially applies to the skulls of children and of the young, which we have seen to be essential for any just conclusion. I am able, however, to refer to two youthful skulls sufficiently perfect in this respect, in which there is well marked post-coronal, or saddle-formed contraction, but which present no obliteration of these sutures.

In a large series of upwards of twenty dolichocephalous British skulls from Winterbourn Monkton, North Wilts, which, though not from a tomb of that description, are probably to be referred to the same period and people with those from the long barrows, the post-coronal depression is more or less obvious in almost every instance, and in about half the number exists in a comparatively marked degree. It is important to observe, that in the calvarium of a boy of about five (No. 42), and in another of a girl of about seven years (No. 41), this is quite as apparent, or even more so, than in any of the adult skulls. In one of the latter (No. 40), the form approaches more closely to the *klinocephalus* of Virchow, than in the rest. Here the coronal depression is trivial, and is before rather than behind the suture so called. There is, however, a marked contraction in each temporal region, and the parietal eminences are full and prominent: there is no particular fulness of the forehead. Of the coronal and sagittal sutures there is no trace internally, and it is probable that the obliteration of the left spheno-parietal (on the right side the ali-sphenoid has been broken away) is but a part of the general premature obliteration so observable in the series. In the girl's skull, in addition to that in the post-coronal region, there is a parallel depression across the posterior third of the parietals, producing a sub-globose dilatation of the intermediate parietal region, approximating to that observed in the macrocephalic crania from the Crimea and in those from Peru. The same skull is, moreover, a curious example of the "obliquely contracted (wry) skull," and "posterior variety" of Virchow. The right frontal eminence is about half an inch in advance of the left, whilst the left half of the occipital projects to the same extent beyond the right. The synostosis is confined to the left side of the lambdoidal suture. There were originally two interparietal bones, the suture separating which remains distinct.

At an early period, the right interparietal became united to the right supra-occipital, and the left to the upper and posterior angle of the

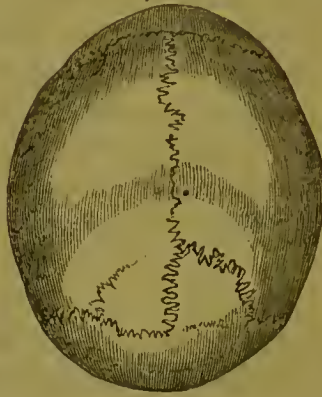


FIG. 9. *Obliquely-verticle View of Synostotic Skull from Monkton.—Quarter Diameter.*

left parietal. The bizarre and, at first sight, puzzling outline of the occiput is explained by this unsymmetrical and rare form of synostosis. In nearly all the skulls of this series the sutures are more obliterated than usual. Three calvaria of men, of 50 to 65 years, present considerable rugosities in the line of the obliterated sagittal, which in two assumes the form of a *carina* continued along the frontal. The synostosis may perhaps be of the infantile description; but if it had any influence in the production of the lengthened form, this must have been trivial in extent; the dolichocephalism being obviously original and proper to the series.*

In the Museum at Guy's Hospital are two skulls from the chambered barrow at Uley, Gloucestershire; one of which, that of a man far advanced in life, has been described in the pages of *Crania Britannica* (Pl. XXIV, 5). The other, that of a girl of nine or ten years of age, is of much interest, in connection with the present inquiry.† Like its companion adult skull, it is very dolichocephalous, having the proportion of breadth as '73 to the length taken as 100. There is a somewhat saddle-formed contraction, which extends along the

* These skulls, with the circumstances under which they were discovered, are described in *Cran. Brit.* Pl. XXVIII, 58.

† No. 3201. Mus. Guy's Hospital. The skull is briefly described *Cran. Brit.* Pl. XXIV, 5. p. (5.)

parietals through the two first-fifths of the sagittal suture. This and the sutures generally, inclusive of the spheno-frontal and spheno-parietal, are quite distinct, so far as can be seen both within and without. There is only one exception, viz., the left occipito-mastoid, which is completely effaced, so that the left temporal bone is ossified to the occipital; whilst on the opposite side, the two bones are separated by a distinctly open suture. Neither the dolichocephalism nor the post-coronal depression in this skull can possibly be explained by synostosis.

A skull from a very ancient interment, which was discovered about a mile and a half from Bath, in December, 1863, is perhaps of some importance, in reference to the question before us. In digging for a reservoir in a valley at Charlcombe, the workmen exposed a rude cist of oolitic stone, containing the skeleton of a girl or young woman, not more than 17 years of age, as shown by the separated epiphyses of such of the bones as were preserved. The strata covering the cist are described as consisting of,

	ft.	in.
1. Turf and surface mould	1	0
2. Drift of oolite and clay	1	0
3. Peat, containing fragments of fossil coral, } pieces of hazel, bones of Red-deer or Elk }	1	6
4. Blue tenacious clay	5	0
Total depth	11	6

The body had been interred in a partially-upright or sitting posture, in a small cist; which was about three feet in depth, and had a capstone of fossil coral, which rested immediately on the skull. Nothing whatever was found with the skeleton. Though not covered by a long barrow, this interment must have been within the limits of the British tribe of Dobuni who bordered on the Belgæ, in the neighbourhood of Aquæ Solis, and in whose district long and chambered barrows so much abound. It probably belonged to the very people by whom those peculiar tombs were raised.

The skull is smooth, thin, and delicate; is of decidedly elongate or dolichocephalic type, the greatest breadth (5·3 in.) being to the length (7·2 in.) as ·73 to 1·00. The height (5·4 in.) is in the proportion of ·75 to the length. The greatest length is in a line from the glabella to the centre of the upper scale of the occiput. In the brachycephalic class of British skulls the greatest length is usually

in a line from the glabella to the *inion*, or "tuberosity" of the transverse occipital spine. In the skull from Charlecombe this line measures only 6.4 inches, and falls short of the greatest length by as much as eight-tenths of an inch, or 20 millimeters. This implies an unusual backward prolongation of the posterior lobes of the brain and of the corresponding part of the occipital bone. The lengthened form of skull is that which we have learned from M. M. Gratiolet and P. Broca to distinguish as *occipital dolichocephalism*. Turning to the upper part of the calvarium, the frontal region is narrow, though not particularly low. The supraciliary ridges are slightly marked, but the glabella is full, and the frontal and parietal eminences are well expressed. There is a broad but very shallow depression behind the coronal suture which is prolonged downwards and backwards across the occiput, in the line of the transverse spine, where the depression is most pronounced and is quite considerable. As all the sutures, including the sphenoidal, are open and gaping, synostosis can have had nothing to do with any of the peculiarities in the form of this skull. Is it probable that this depression has arisen from the distorting effect of some form of head dress, similar perhaps to that which is still applied to the heads of infants in various parts of France, as described by Drs. Foville and Lunier? This consists of a neckerchief passed twice round the head from the corona either to the back of the neck, when the resulting deformity (which is that of the Charlecombe skull) is designated *annular* by Dr. Gosse; or is carried under the chin and jaw, when it is termed *bilobed* by the same writer.* The question just asked must I believe be answered by a negative.

Rejecting the idea of these slighter deviations from a regular form being produced by obliteration of the sutures, and consequent synostosis of the sphenoid with the frontal and parietals, we are led to search for some other cause. And here we inquire whether they are not to be regarded as original and natural, and to be referred to the form and course of development of the brain; such as may be peculiar to individuals and families, to tribes and races. The very eminent Professor von Baer observes, that in dolichocephalic skulls regarded by him as undistorted, there is often a shallow depression behind the

* Foville, *Déform. du Crâne résultant de la Méthode de couvrir la Tête des Enfants*, 1834. Lunier, *Déform. du Crâne, dans le Département des Deux-Sèvres* *Annals Med. Psychol.* 1852, tom. iv. pp. 42, 56. Gosse, *Déform. Artif. du Crâne*, 1855. (*Tête annulaire*) p. 62, pl. v. fig. 1 (*Tête bilobée*), p. 66. pl. v. fig. 2, pl. ii. fig. 3., pl. iv. fig. 9.

coronal suture, which he thinks may depend upon an unusually strong development of the anterior and posterior *genu* of the *corpus callosum*.* Professor Rolleston appears to take a similar view of the "broad and shallow depression in the line of the coronal suture often seen in well-developed crania."† We require a test to distinguish a normal depression of this sort, from that artificial one in the same situation produced by bandaging. It is not to be supposed that all transverse depressions of the calvarium are independent of artificial agency. The macrocephalous skulls of the Crimea and the constricted and flattened skulls of Peru and other parts of America afford ample proof that this is not the case. We must also refer (as is admitted by von Baer) those slighter deformities in the modern French skulls which have been alluded to, to the same cause; though we should distinguish the latter as undesignedly and the Crimean and Peruvian skulls as designedly distorted.

Obliteration of the sutures may no doubt arise from the long continued pressure on the growing skull of bandages, ligatures, pads, and boards, such as are employed in the deforming processes of so many peoples. Professor Dr. D. Wilson, in common with many previous observers, has remarked on the premature ossification of the sutures as very common in the diversely-distorted flat-headed skulls of America. That external pressure "not infrequently" produces obliteration of the sutures in the points where it is applied, has the support of the distinguished anatomist and cautious observer, Professor Welcker of Halle. In a Peruvian (Huanca) skull, Professor Welcker says, "the coronal suture in its middle, where the ligature crossed, which was applied in the moulding of the skull, was obliterated, whilst in the normal situation of commencing obliteration in the neighbourhood of the *angulus sphenoidalis* it was perfectly open."‡ Dr. William Turner also observes, that in artificial deformation, "the form into which the head is thrown by the pads, bandages, and other apparatus employed, is in some measure preserved by the premature synostosis induced by their application for a considerable period. So that when the compressing agents are removed, the head still retains the form into which they had thrown it. What they have initiated the premature synostosis induced by them has

* *Die Makrocephalen der Krym*, &c., 1859, p. 11. Comp. pp. 9, 17.

† *Brit. and For. Med. Chir. Review*, April, 1863, p. 508.

‡ *Wachsthum und Bau*, p. 15.

kept up. I have now examined seven artificially flattened crania of Chinook and other flat-headed Indians, and in all of them the sagittal and coronal sutures are in a great measure obliterated. The lambdoidal suture is not so frequently affected. The lateral lines of sutures (the spheno-frontal, spheno-parietal, and squamous) not being subjected to the pressure, are but little altered.”*

My own observations of the state of the sutures in skulls distorted by artificial means are quite in agreement with those here quoted. But though bandaging does cause obliteration of the sutures concurrently with the annular deformations which immediately result from it, it does not appear to have been the cause of either the one or the other in the dolichocephalous skulls from the Long Barrows. Since the publication, ten years ago, of Dr. Gosse's work “On Artificial Deformations of the Skull,” there has been too much disposition to attribute every peculiarity of cranial form to that cause. I have myself, on different occasions, and up to a somewhat recent period, fallen into this error. Minor degrees of saddle-formed contraction in the coronal and temporal regions, are not only to be observed in the ancient British crania, which are more particularly considered in this paper, but likewise in those of Negroes and in many other races, especially such as are naturally dolichocephalous.

After much consideration and inquiry, the conclusion I have come to is that this contraction is altogether normal, and connected with the natural form and course of development of the brain. It corresponds almost precisely with the situation of the great fissure of Rolando, which divides the anterior from the middle cerebral lobes; and just in proportion as these neighbouring lobes may tend to assume a full and rounded form, so must be the amount of the corresponding intervening depression which is communicated to the surface of the skull. In like manner, other depressions which are observed on the cranial surface may represent the interspaces between other lobes of the brain; as that between the temporal and the posterior and the upper surface of the cerebellum. Such, I think, is the explanation of certain depressions on several ancient Gaulish skulls, from the cavern of Orrouy (Oise), which are preserved in the Museum of the Society of Anthropology of Paris, and of which casts, through the liberality of M. P. Broca, have been presented to several collections in this country.

* Cranial Deformities, &c. Nat. Hist. Review, 1864, p. 106.